Remarks:

Reconsideration of the application is requested.

Claims 1 and 3-8 remain in the application.

In item 1 on pages 3-6 of the above-mentioned Office action, claims 1 and 3-6 have been rejected as being unpatentable over Sun et al. (US Pat. No. 5,612,249) in view of Joseph et al. (US Pat. No. 5,907,777) under 35 U.S.C. § 103(a).

As will be explained below, it is believed that the claims were patentable over the cited art in their original form and the claims have, therefore, not been amended to overcome the references.

Before discussing the prior art in detail, it is believed that a brief review of the invention as claimed, would be helpful.

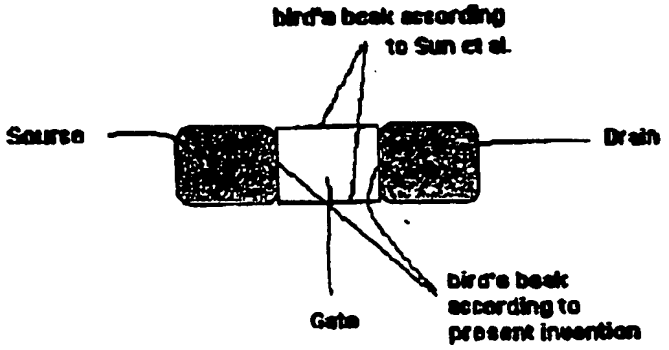
Claim 1 calls for, inter alia:

> a gate disposed on said gate oxide over an area between said first conductive region and said second conductive region and having at least one side wall adjacent at least one of said conductive regions;
> .
> .
> .
> said gate oxide insulating said gate from said semiconductor substrate and having a thickened area in a region below said side wall of said gate. (Emphasis added.)

As described in the instant application, the growth in the integration density of integrated circuits requires the gate length of transistors to be reduced. However, the problem that arises by reducing the gate length is the increased leakage current, in particular the so-called gate induced drain leakage (GIDL). In order to overcome this parasitic effect, methods known in the art can be applied which are explained on page 3, lines 9-16 of the specification of the instant application. These methods, however, cause additional process limitations and/or have other disadvantages (compare page 3, lines 9-16 of the specification).

One of the objectives of the invention of the instant application is to provide a transistor which both leads to a reduced GIDL and does not add unnecessary process complexity. This objective is achieved by providing a thickened area in the gate oxide in the region below a side wall of the gate, i.e. the so-called bird's beak.

An exemplary MOS transistor, depicted in bird's eye view, is shown in the figure below.



Source, drain and gate of the transistor are shown in the figure. Typically for an ordinary transistor, these three regions are arranged serially, thus defining a designated direction of the current flow. In the exemplary embodiment shown in the figure, this direction is the one commonly known as x-direction. The other dimension of the plane shown in the figure, commonly known as y-direction, is perpendicular to the current flow direction.

In order to understand one aspect of the inventiveness of the invention of the instant application, it is important to understand the following structural difference between Sun et al. and the invention of the instant application. Sun et al. disclose a bird's beak which is situated at the sides parallel to the current flow. This can be clearly seen from Figs. 15 and 18-20 of Sun et al. As can be seen in Fig. 15, reference number 10 denotes the gate region. The "Field Oxide Bird's Beak Encroachment" is shown located on the side of the gate region 10. As can be seen in Figs. 18-20, the source and drain region 22/24 is indicated. That is, the x-direction in Sun et al. defines the current flow direction (compare Figs. 18-19). Hence, the y-direction is perpendicular to the current flow direction. Since the bird's beaks are shown only in lateral-view-figures of the y-direction of the transistor, consequently the bird's beaks in Sun et al. are located on the sides parallel to the current flow.

In the invention of the instant application, however, the bird's beaks are located along a virtual axis perpendicular to the current flow direction. This can be clearly seen from Fig. 4 of the instant application. Furthermore, this particular location is one of the important features of the invention of the instant application, because it is only in this way that the aim of reducing the GIDLs can be achieved.

Thus, the disclosure of the instant application and Sun et al. differ from each other particularly in the following aspect: the teaching of Sun et al. does not provide a solution for the problem of GTDLQ. This problem is not mentioned in Sun et al. nor is a solution derivable from Sun et al. In view of this objective, a bird's beak at the position disclosed in Sun et al. is not helpful at all. No hint is given for the use proposed in the invention of the instant application.

Furthermore, since the bird's beak in Sun et al. is of no use, the teaching of Sun et al. intends to minimize it as much as possible. This can be clearly seen from column 6, lines 60-63:

> *"The nitride spacer 13 not only prevents the sidewall from oxidizing, but it also offsets the oxide encroachment (commonly known as "bird's beak") under the active area during the field oxidation."*

and from column 7, lines 17-21:

"Also, in order to reduce the stress of oxide encroachment at the edge of the active area and shorter oxide encroachment (or smaller bird's beak), the temperature of field oxidation and thickness of the field oxide should be optimized. "

In contrast, the invention of the instant application teaches the use of the bird's beak in order to reduce the GIDLS. On page 11 of the specification of the instant application, an example of an oxidation process is disclosed which is conducted in order to produce a bird's beak. By varying the disclosed process parameters and oxidation time, the lateral extension of the bird's beak can further be increased.

Joseph et al. disclose a method for forming field effect transistors. However, Joseph et al. do not mention anywhere a bird's beak.

It is accordingly believed to be clear that none of the references, whether taken alone or in any combination, either show or suggest the features of claim 1. Claim 1 is, therefore, believed to be patentable over the art and since claims 3-6 are dependent on claim 1, they are believed to be patentable as well.

In item 2 on pages 6-7 of the above-mentioned Office action, claims 7-8 have been rejected as being unpatentable over Sun

et al. and Joseph et al. and further in view of Krautschneider (US Pat. No. 5,854,500) under 35 U.S.C. § 103(a).

As discussed above, claim 1 is believed to be patentable over the art. Since claims 7-8 are ultimately dependent on claim 1, they are believed to be patentable as well.

In view of the foregoing, reconsideration and allowance of claims 1and 3-8 are solicited.

In the event the Examiner should still find any of the claims to be unpatentable, counsel would appreciate a telephone call so that, if possible, patentable language can be worked out.

If an extension of time for this paper is required, petition for extension is herewith made. Please charge any fees which might be due with respect to Sections 1.16 and 1.17 to the Deposit Account of Lerner and Greenberg, P.A., No. 12-1099.

Respectfully submitted,

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For Applicants

YHC:cgm

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